NUMERICAL RESULTS FROM "PARMILA" FOR THE FIRST TWO TANKS OF LINAC

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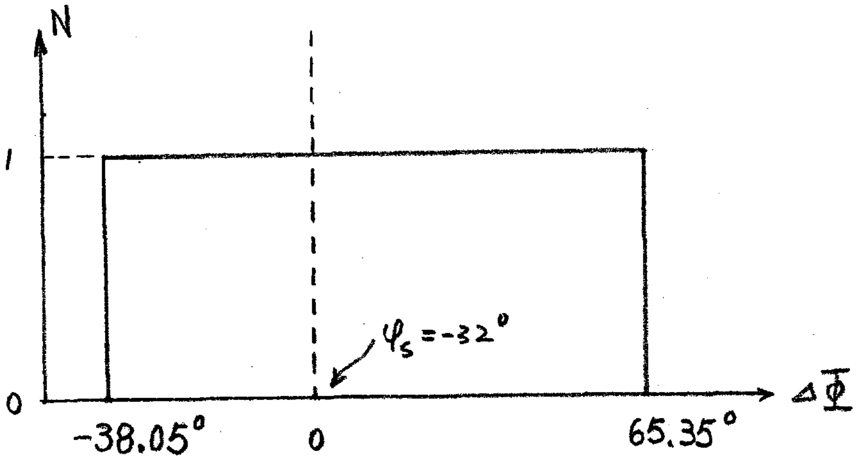
The numerical results presented in this report are for the purpose of calibrating the first two tanks of the NAL Linac. The computer program "Parmila"[1] is used to simulate the beam dynamics of 500 non-interacting particles. The transverse properties of the beam at the emittance probe (17.62 cm in front of the first tank) are as follows[2]:

$\epsilon_x = 1.9\pi$ cm-mrad	$\epsilon_y = 2.4\pi$ cm-mrad
$\alpha_x = 1.57$	$\alpha_y = 2.72$
$\beta_x = 84$ cm	$\beta_y = 285$ cm
$\gamma_x = 0.413$ cm^{-1}	$\gamma_y = 0.029$ cm^{-1}

In the longitudinal direction, the beam is assumed to be bunched ($\Delta T = \pm 0.01$ MeV, $\Delta\phi = 30°$) and unbunched ($\Delta T = 0$, $\Delta\phi = \pm 180°$) at the probe. The other information necessary for the computer program is taken from the designed values.[3]

By observing the particle transmission as the phase angle $\Delta\Phi$ between tanks is varied, it is possible to determine the phase acceptance as shown in Figs. 1 and 2. Note that during the course of computation, a particle is considered lost when it's energy is 2 MeV below the synchronous values. Using one particle with synchronous phase ($\phi_s = -32°$) and injection energy ($T_o = 0.75$ MeV) the phase acceptance limits, $\phi_1 = 65.35°$, $\phi_2 = -38.05°$ are obtained. The difference of ϕ_1 from the theoretical value of 64° can be partly explained by the Promé terms.[4] In Fig.3



The effects of various injection energies on the transmission of synchrouous particles are shown.

ACKNOWLEDGMENT:

We wish to thank Sho Ohnuma for helpful discussions.

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Subject

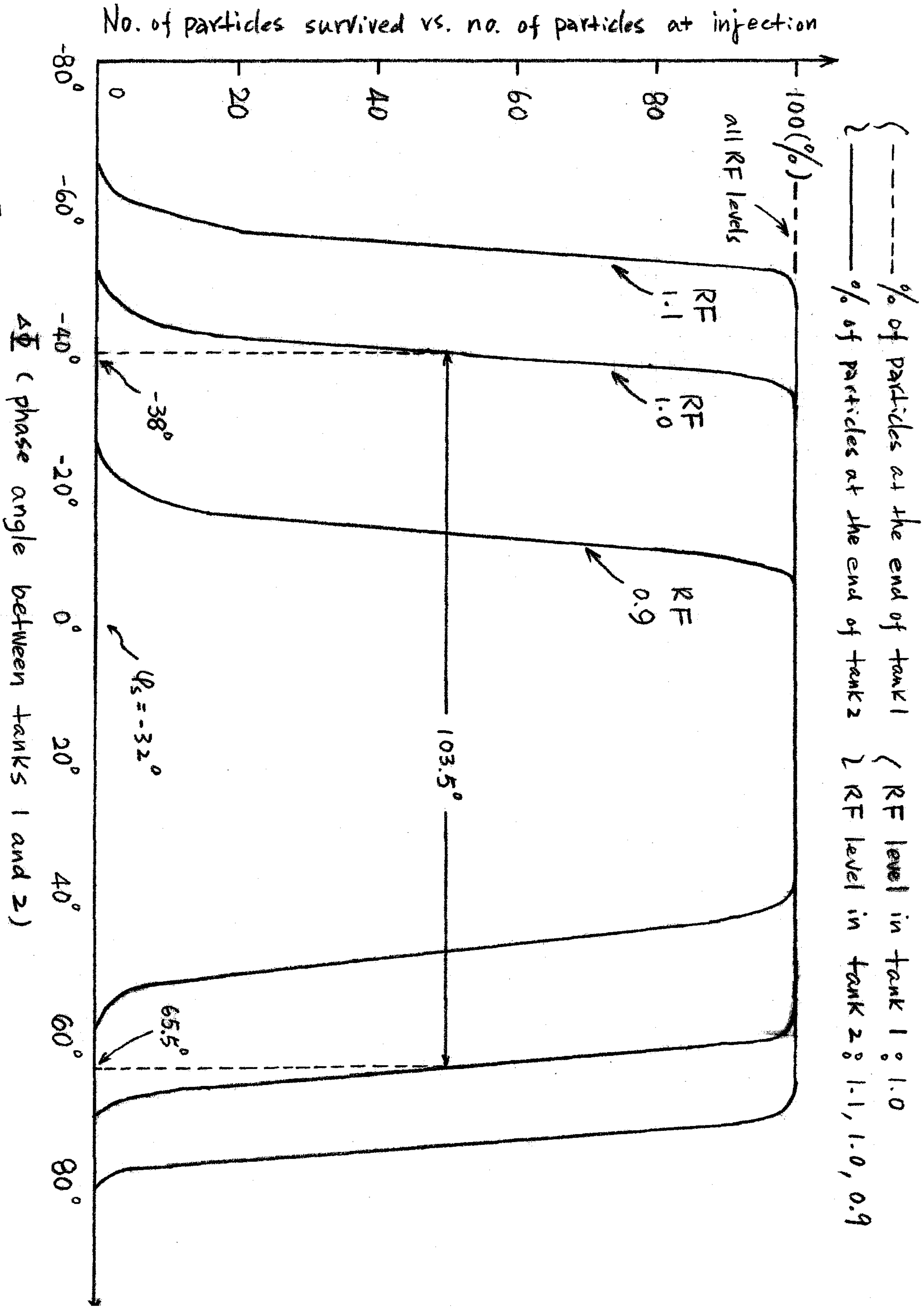

Fig. 1 Transmission of synchronous particles in tanks 1 and 2 with an initially bunched beam ($\Delta T = \pm 0.01$ MeV, $\Delta\varphi = \pm 30°$)

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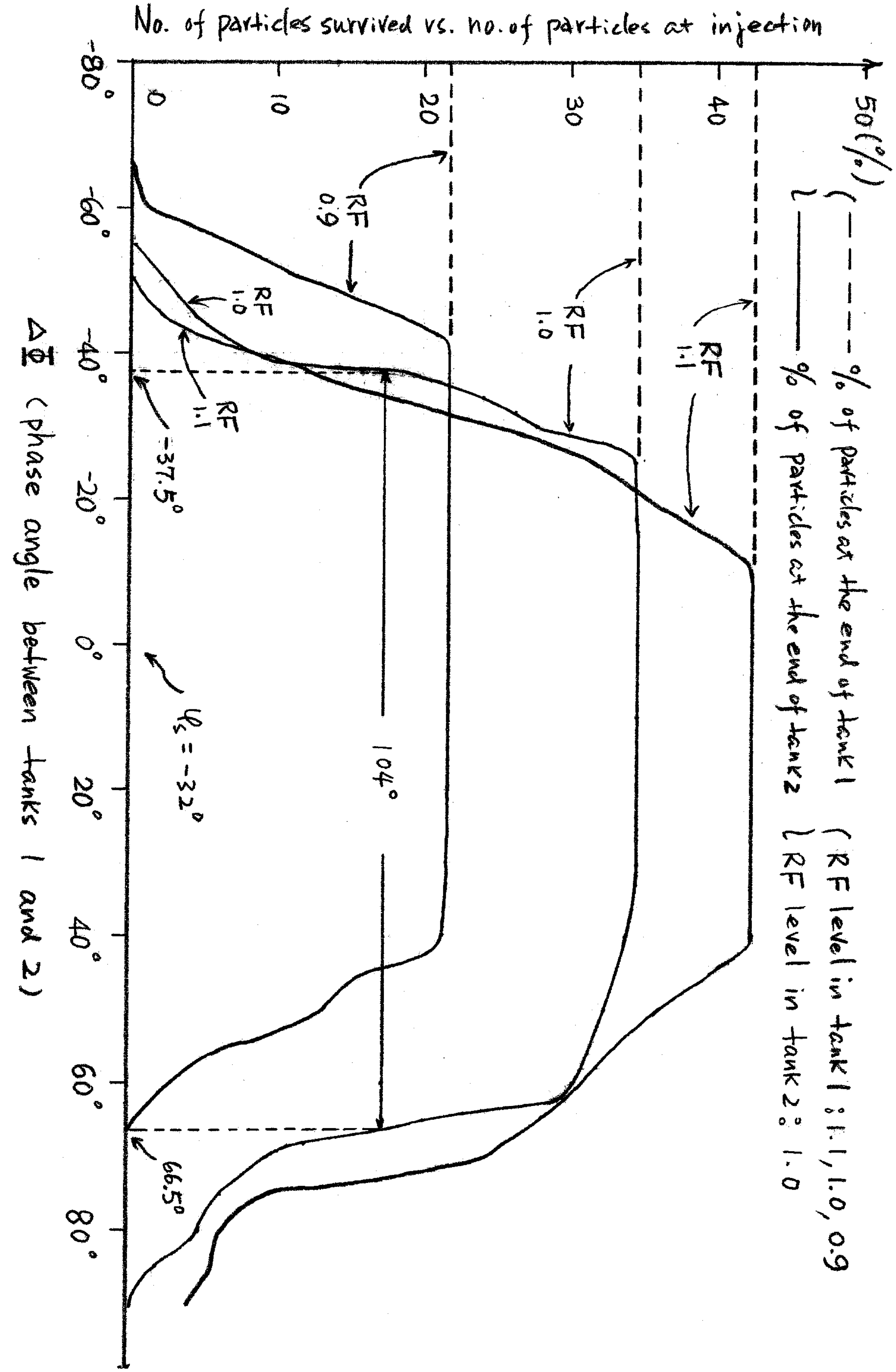

Fig. 2 Transmission of synchronous particles in tanks 1 and 2 with an initially unbunched beam ($\Delta T = 0$, $\Delta\varphi = \pm 180°$)

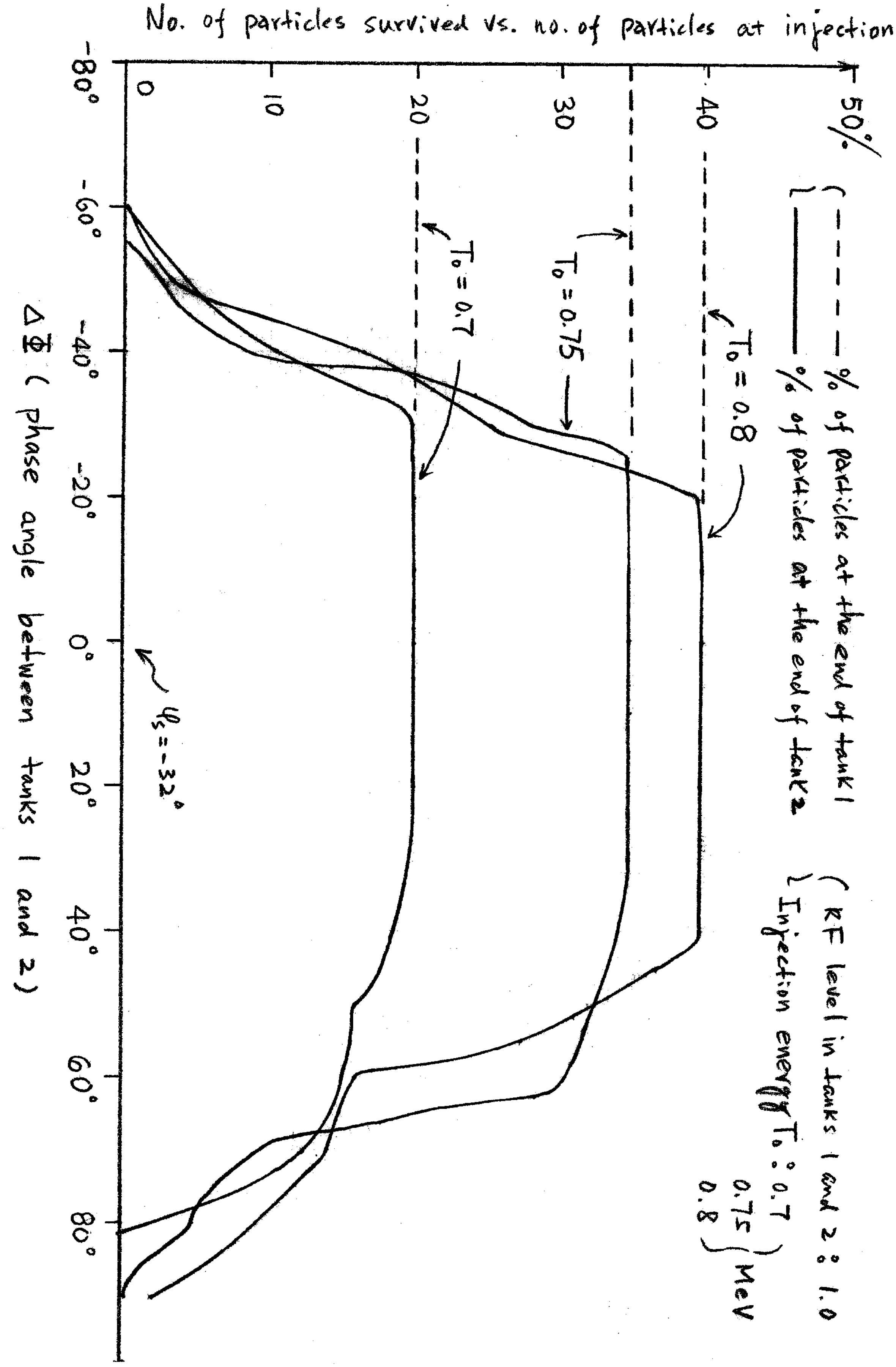

Fig. 3 Transmission of synchronous particles in tanks 1 and 2 with an initially unbunched beam ($\Delta T = 0$, $\Delta\varphi = \pm 180°$)